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TABLES FOR ESTIMATING STEM RESIDUES FOR PONDEROSA PINE, WESTERN LARCH, DOUGLAS FIR, AND LODGEPOLE PINE IN WESTERN MONTANA

12.12.2

TABLES FOR ESTIMATING STEM RESIDUES FOR PONDEROSA PINE, WESTERN LARCH, DOUGLAS FIR, AND LODGEPOLE PINE IN WESTERN MONTANA

By

James L. Faurot

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EXPERIMENT STATION

INTRODUCTION

The accompanying tables have been prepared for the purpose of predicting stem residue volumes either preceeding or following harvesting operations. The trees selected for the study do not exceed eighty years of age, and so may represent stem development in unmanaged second-growth stands. The minimum diameter is 1 1/2 inches DBH(o.b.) and the maximum diameter varies by species, given the constraints of age and the sample population. The sample trees were obtained from selected stands on both public and private lands in Western Montana and include a broad range of sites.

STEM MEASUREMENT

The total height and DBH of the felled tree were determined first. The tree was then divided into six segments of equal length for measurement purposes. Diameter measurements, outside and inside bark, were obtained using a diameter tape and bark gauge at the base and top of each segment and at an assumed stump height of 1 foot above average ground level.

STEM VOLUME DETERMINATION

The volume of each truncated segment was obtained by treating the segment as a cone frustrum while the top segment was treated as a cone. To overcome the problem of root swell, the volume of the base segment was obtained by calculating the stump volume and adding it to the remaining segment volume. All volumes are calculated in cubic feet.

VOLUME TABLE CONSTRUCTION

Regression analysis methods were used to develop each of the tables. Several predictive equations were tried for each data set, the final model being the one that was "best" from a statistical point of view.

A word of caution to the user: tabular values have been extended approximately two height classes beyond the range of the sample data. Extrapolation beyond the data range must be questioned. This is particularly true toward the upper limits of the diameter classes because of the limited number of trees represented in those classes.

EXPLANATION OF TABLES

Total Volume: Volume of the entire stem, inside bark, including stump and top.

Top Volume: The volume of that portion of the tree that is above the minimum top diameter limits of 2 to 8 inches, d.i.b. and a minimum merchantable length of 8 feet.

Gross Bark Volume: The volume of bark of the entire stem, including stump and top without regard for void volume.

Double Bark Thickness, Diameter Outside Bark: The average double bark thickness for a stem section at any position in the stem.

Relationship Between Stump Diameter and Diameter at Breast Height: A table developed mainly for stand or stem reconstruction purposes.

Stand Volume Tables: Knowing the average basal area and height of a stand, the volume estimate may be read directly from the table. Stand volume equations are normally developed from multiple stand samples. The tables included here are based upon single stem volume equations which, when extended, provide the tabular values. The only stand tables existing for the species involved in this study are for lodgepole pine.[1] A comparison between the two tables shows remarkable agreement, suggesting that the approach used here is worthy of application until such time as conventional stand volume tables are developed.

[1]Cole, D. M. 1971. A cubic-foot stand volume equation for lodgepole pine in Montana and Idaho. USDA For. Ser. Res. Note INT-150, 8p. Int. For. & Range Exp. Stn., Ogden, Utah.

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PONDEROSA PINE

TOTAL VOLUME, INSIDE BARK, INCLUDING STUMP AND TOP, CUBIC FEET

	Height												
DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.17	0.23	0.30	0.40	0.53	0.70							
3	0.40	0.52	0.67	0.86	1.11	1.44							
4	0.72	0.92	1.17	1.49	1.89	2.41	3.06						
5	1.15	1.44	1.81	2.28	2.86	3.59	4.50	5.65					
6	1.67	2.08	2.59	3.22	4.00	4.97	6.17	7.67					
7	2.30	2.84	3.50	4.31	5.31	6.54	8.06	9.93	12.23				
8	3.04	3.72	4.54	5.56	6.79	8.31	10.16	12.42	15.19				
9		4.71	5.72	6.95	8.44	10.25	12.45	15.13	18.37	22.32			
10		5.82	7.03	8.49	10.25	12.38	14.94	18.05	21.79	26.31			
11			8.47	10.17	12.22	14.67	17.62	21.17	25.42	30.54			
12				12.00	14.34	17.14	20.49	24.49	29.27	34.98	41.81		
13				13.97	16.62	19.78	23.53	28.00	33.32	39.64	47.17		
14				16.08	19.05	22.58	26.75	31.70	37.56	44.51	52.74	62.49	
15				18.33	21.64	25.54	30.14	35.58	42.00	49.57	58.51	69.06	
16				20.72	24.37	28.66	33.71	39.64	46.62	54.83	64.48	75.84	
17				23.25	27.25	31.94	37.44	43.88	51.43	60.28	70.65	82.80	
18					30.28	35.37	41.33	48.28	56.41	65.91	77.00	89.96	
19					33.45	38.96	45.38	52.86	61.57	71.71	83.53	97.29	
20						42.70	49.59	57.60	66.90	77.70	90.24	104.81	121.73
21						46.59	53.96	62.50	72.39	83.85	97.12	112.49	130.29
22						50.63	58.49	67.56	78.05	90.17	104.17	120.34	139.02
23						54.81	63.16	72.78	83.87	96.65	111.38	128.35	147.90
24						59.14	67.99	78.16	89.85	103.30	118.75	136.52	156.94

Log V = -1.52198 + 2.12327 (log D) + 0.0138002 (H) - 0.00561155 (log D) (H)

S.D. of coeff. 0.0231878 0.000552903 .000420125

Percent error of predicted value = 12.8

Percent bias of predicted value = -0.66

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(2-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
3	0.077	0.099	0.114	0.126	0.136	0.145							
4	0.052	0.071	0.085	0.096	0.106	0.115	0.123						
5		0.055	0.068	0.078	0.088	0.097	0.105	0.112					
6		0.045	0.056	0.066	0.075	0.084	0.091	0.098					
7		0.037	0.048	0.058	0.066	0.074	0.081	0.088	0.095				
8		0.032	0.042	0.051	0.059	0.067	0.074	0.080	0.087				
9			0.037	0.046	0.053	0.061	0.067	0.074	0.080	0.087			
10			0.034	0.041	0.049	0.056	0.062	0.069	0.075	0.081			
11			0.030	0.038	0.045	0.052	0.058	0.064	0.070	0.076			
12			0.029	0.035	0.042	0.048	0.054	0.061	0.066	0.072	0.078		
13			0.026	0.033	0.039	0.045	0.051	0.057	0.063	0.069	0.074		
14			0.024	0.030	0.037	0.043	0.049	0.054	0.060	0.066	0.071	0.076	
15			0.022	0.028	0.035	0.040	0.046	0.052	0.057	0.063	0.068	0.073	
16				0.027	0.033	0.038	0.044	0.049	0.055	0.060	0.066	0.071	
17				0.025	0.031	0.037	0.042	0.047	0.053	0.058	0.063	0.068	
18				0.024	0.030	0.035	0.040	0.046	0.051	0.056	0.061	0.066	
19				0.023	0.028	0.033	0.039	0.044	0.049	0.054	0.059	0.064	
20				0.022	0.027	0.032	0.037	0.042	0.047	0.052	0.057	0.062	
21						0.031	0.036	0.041	0.046	0.051	0.056	0.061	0.666
22						0.030	0.035	0.040	0.044	0.049	0.054	0.059	0.064
23							0.034	0.038	0.043	0.048	0.053	0.057	0.062
24								0.037	0.042	0.047	0.051	0.056	0.061

Log V = - 0.460586 - 2.09688 (log D) + 0.733094 (log D) (log H)

S.D. of coefficients 0.143811 0.0617454

Percent error of predicted values = 23.7

Percent bias of predicted values = - 2.38

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(3-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
4	0.241	0.323	0.383	0.432	0.475	0.513	0.547						
5		0.241	0.294	0.338	0.377	0.412	0.445	0.475					
6		0.190	0.237	0.277	0.312	0.345	0.375	0.404					
7		0.155	0.197	0.233	0.266	0.297	0.325	0.352	0.377				
8		0.130	0.168	0.202	0.232	0.260	0.287	0.312	0.336				
9			0.146	0.177	0.205	0.232	0.257	0.281	0.304	0.326			
10			0.129	0.158	0.184	0.209	0.233	0.256	0.278	0.299			
11			0.115	0.142	0.167	0.191	0.213	0.235	0.256	0.277			
12			0.104	0.129	0.153	0.175	0.197	0.218	0.238	0.258	0.277		
13			0.094	0.118	0.140	0.162	0.183	0.203	0.222	0.241	0.260		
14			0.086	0.109	0.130	0.151	0.170	0.190	0.208	0.227	0.245	0.263	
15			0.080	0.101	0.121	0.141	0.160	0.178	0.197	0.214	0.232	0.249	
16				0.094	0.113	0.132	0.151	0.168	0.186	0.203	0.220	0.237	
17				0.088	0.106	0.125	0.142	0.160	0.177	0.193	0.210	0.226	
18				0.082	0.100	0.118	0.135	0.152	0.168	0.184	0.201	0.217	
19				0.078	0.095	0.112	0.128	0.145	0.161	0.176	0.192	0.208	
20				0.073	0.090	0.106	0.122	0.138	0.154	0.169	0.184	0.200	
21						0.101	0.117	0.132	0.147	0.163	0.177	0.192	0.207
22						0.097	0.112	0.127	0.142	0.156	0.171	0.186	0.200
23							0.107	0.122	0.136	0.151	0.165	0.179	0.194
24								0.117	0.132	0.146	0.160	0.174	0.188

$\text{Log } V = 0.299133 - 2.22255 (\log D) + 0.699746 (\log D)(\log H)$

S.D. of coefficients · 0.141233 0.05960

Percent error of predicted values = 20.8

Percent bias of predicted values = - 2.05

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(4-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
5	0.578	0.770	0.910	1.025	1.124	1.212	1.291	1.364					
6		0.600	0.723	0.825	0.914	0.994	1.067	1.134					
7		0.486	0.595	0.687	0.768	0.841	0.908	0.971	1.029				
8		0.405	0.502	0.586	0.660	0.727	0.790	0.848	0.903				
9			0.433	0.509	0.577	0.640	0.698	0.753	0.804	0.853			
10			0.379	0.449	0.512	0.571	0.625	0.676	0.725	0.772			
11			0.336	0.401	0.460	0.515	0.566	0.614	0.660	0.705			
12			0.301	0.362	0.417	0.468	0.517	0.562	0.606	0.648	0.689		
13			0.272	0.329	0.381	0.429	0.475	0.519	0.560	0.601	0.640		
14			0.247	0.301	0.350	0.396	0.440	0.481	0.521	0.560	0.597	0.633	
15			0.227	0.277	0.324	0.367	0.409	0.449	0.487	0.524	0.560	0.595	
16				0.257	0.301	0.343	0.382	0.420	0.457	0.493	0.527	0.561	
17				0.239	0.281	0.321	0.359	0.395	0.431	0.465	0.498	0.531	
18				0.223	0.263	0.301	0.338	0.373	0.407	0.440	0.472	0.504	
19				0.209	0.248	0.284	0.319	0.353	0.386	0.418	0.449	0.480	
20				0.197	0.234	0.269	0.303	0.335	0.367	0.398	0.428	0.458	
21						0.255	0.288	0.319	0.350	0.380	0.409	0.438	0.466
22						0.242	0.274	0.305	0.334	0.363	0.392	0.420	0.447
23							0.261	0.291	0.320	0.348	0.376	0.403	0.430
24								0.279	0.307	0.334	0.361	0.388	0.414

$\text{Log } V = 0.842466 - 2.13641 (\log D) + 0.59070 (\log D)(\log H)$

S.D. of coefficients 0.162516 0.065958

Percent error of predicted values = 21.1

Percent bias of predicted values = - 2.08

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(5-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
6	1.357	1.390	1.674	1.910	2.116	2.301	2.470	2.626					
7		1.113	1.362	1.572	1.757	1.924	2.078	2.221	2.355				
8		0.918	1.139	1.328	1.496	1.648	1.789	1.921	2.046				
9			0.973	1.145	1.298	1.438	1.568	1.691	1.807	1.917			
10			0.846	1.002	1.143	1.273	1.394	1.508	1.616	1.720			
11			0.744	0.888	1.019	1.139	1.253	1.360	1.462	1.559			
12			0.663	0.796	0.917	1.030	1.136	1.237	1.333	1.426	1.515		
13			0.595	0.719	0.833	0.939	1.039	1.134	1.225	1.313	1.398		
14			0.539	0.655	0.762	0.862	0.956	1.046	1.133	1.217	1.298	1.376	
15			0.492	0.600	0.701	0.795	0.885	0.971	1.054	1.134	1.211	1.286	
16				0.553	0.648	0.738	0.823	0.905	0.984	1.061	1.135	1.207	
17				0.513	0.603	0.688	0.769	0.848	0.923	0.997	1.068	1.138	
18				0.477	0.563	0.644	0.722	0.797	0.869	0.940	1.008	1.076	
19				0.445	0.517	0.605	0.679	0.751	0.821	0.889	0.955	1.020	
20				0.417	0.495	0.570	0.641	0.711	0.778	0.843	0.907	0.970	
21						0.538	0.607	0.674	0.739	0.802	0.864	0.924	0.984
22						0.510	0.576	0.641	0.703	0.764	0.824	0.883	0.941
23							0.548	0.610	0.671	0.730	0.788	0.845	0.902
24								0.583	0.642	0.699	0.755	0.811	0.865

Log V = 1.26403 - 2.20809 (log D) + 0.58980 (log D) (log H)

S.D. of coefficients 0.155923 0.0615612

Percent error of predicted values = 17.9

Percent bias of predicted values = - 1.48

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(6-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
7	1.393	2.123	2.716	3.236	3.706	4.141	4.548	4.933	5.299				
8		1.680	2.187	2.637	3.048	3.432	3.794	4.138	4.467				
9			1.806	2.201	2.566	2.908	3.233	3.543	3.842	4.130			
10			1.523	1.873	2.199	2.507	2.802	3.084	3.357	3.621			
11			1.304	1.618	1.913	2.193	2.461	2.720	2.971	3.216			
12			1.132	1.416	1.684	1.940	2.187	2.426	2.658	2.885	3.107		
13			0.994	1.252	1.498	1.734	1.962	2.183	2.399	2.611	2.818		
14			0.882	1.118	1.344	1.562	1.774	1.980	2.182	2.381	2.575	2.767	
15			0.788	1.006	1.215	1.417	1.615	1.808	1.998	2.184	2.368	2.549	
16				0.911	1.105	1.294	1.479	1.661	1.840	2.015	2.189	2.360	
17				0.830	1.011	1.189	1.363	1.534	1.702	1.869	2.033	2.196	
18				0.760	0.930	1.097	1.261	1.422	1.582	1.740	1.897	2.052	
19				0.700	0.859	1.017	1.171	1.325	1.476	1.627	1.776	1.924	
20				0.647	0.797	0.946	1.093	1.238	1.383	1.526	1.668	1.810	
21						0.883	1.023	1.161	1.299	1.436	1.572	1.708	1.843
22						0.827	0.960	1.092	1.224	1.355	1.486	1.616	1.746
23							0.904	1.030	1.156	1.282	1.407	1.533	1.658
24								0.974	1.095	1.216	1.336	1.457	1.577

$\text{Log } V = 1.80585 - 2.68641 (\log D) + 0.719723 (\log D)(\log H)$

S.D. of coefficients 0.175437 0.0696747

Percent error of predicted values = 20.6

Percent bias of predicted values = - 1.92

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(7-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
8	1.794	2.961	3.970	4.888	5.744	6.553	7.326	8.069	8.786				
9			3.182	3.964	4.701	5.404	6.079	6.733	7.367	7.984			
10			2.610	3.287	3.930	4.548	5.145	5.726	6.292	6.846			
11			2.183	2.774	3.342	3.891	4.424	4.945	5.456	5.957			
12			1.853	2.377	2.882	3.374	3.855	4.326	4.790	5.246	5.697		
13			1.595	2.061	2.515	2.959	3.396	3.825	4.249	4.668	5.082		
14			1.387	1.807	2.217	2.621	3.020	3.413	3.803	4.189	4.572	4.952	
15			1.217	1.598	1.972	2.341	2.707	3.070	3.430	3.788	4.144	4.497	
16				1.425	1.767	2.107	2.444	2.780	3.114	3.447	3.779	4.110	
17				1.279	1.594	1.907	2.220	2.533	2.844	3.155	3.466	3.776	
18				1.156	1.446	1.737	2.028	2.320	2.611	2.903	3.195	3.487	
19				1.050	1.319	1.590	1.862	2.135	2.408	2.683	2.958	3.233	
20				0.958	1.209	1.462	1.716	1.973	2.230	2.489	2.749	3.010	
21						1.350	1.589	1.830	2.073	2.318	2.564	2.811	3.060
22						1.251	1.476	1.704	1.934	2.166	2.399	2.635	2.871
23						1.163	1.376	1.591	1.809	2.030	2.252	2.476	2.702
24						1.085	1.286	1.491	1.698	1.907	2.119	2.333	2.549

$\text{Log } V = 2.29514 - 3.06128 (\log D) + 0.800789 (\log D)(\log H)$

S.D. of coefficients 0.18462 0.074664

Percent error of predicted values = 20.1

Percent bias of predicted values = - 1.98

PONDEROSA PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(8-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
9			4.993	6.332	7.614	8.852	10.054	11.227	12.375	13.500			
10			4.051	5.196	6.304	7.382	8.436	9.470	10.486	11.488			
11			3.352	4.345	5.314	6.263	7.197	8.118	9.028	9.927			
12			2.821	3.691	4.546	5.391	6.226	7.053	7.874	8.688	9.498		
13			2.406	3.176	3.939	4.696	5.448	6.197	6.943	7.686	8.426		
14			2.077	2.764	3.449	4.133	4.816	5.498	6.180	6.861	7.541	6.229	
15			1.811	2.428	3.047	3.669	4.293	4.918	5.545	6.173	6.802	7.432	
16				2.151	2.714	3.283	3.855	4.431	5.010	5.591	6.176	6.762	
17				1.920	2.435	2.957	3.485	4.017	4.555	5.096	5.640	6.188	
18				1.724	2.198	2.679	3.168	3.663	4.163	4.668	5.178	5.691	
19				1.558	1.995	2.441	2.895	3.357	3.824	4.297	4.775	5.258	
20				1.415	1.819	2.234	2.658	3.090	3.528	3.972	4.423	4.878	
21					1.667	2.054	2.451	2.855	3.267	3.686	4.111	4.542	4.978
22						1.896	2.268	2.649	3.037	3.433	3.835	4.243	4.657
23							2.106	2.465	2.832	3.207	3.588	3.976	4.369
24								2.301	2.649	3.004	3.367	3.736	4.111

Log V = 2.59226 - 3.26371 (log D) + 0.865846 (log D) (log H)

S.D. of coefficients 0.163612 0.0656584

Percent error of predicted values = 16.2

Percent bias of predicted values = - 1.29

WESTERN LARCH

TOTAL VOLUME, INSIDE BARK, INCLUDING STUMP AND TOP, CUBIC FEET

DBH	Height 10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.11	0.21	0.30	0.40	0.49	0.59							
3	0.23	0.45	0.66	0.86	1.06	1.27							
4	0.40	0.77	1.13	1.49	1.84	2.18	2.53						
5		1.18	1.73	2.27	2.80	3.33	3.86	4.38					
6		1.66	2.44	3.21	3.96	4.71	5.45	6.18					
7			3.27	4.29	5.31	6.31	7.30	8.29	9.26	10.24			
8			4.21	5.53	6.83	8.12	9.40	10.67	11.93	13.19			
9			5.26	6.92	8.54	10.16	11.76	13.34	14.92	16.49	18.05		
10				8.45	10.44	12.40	14.36	16.30	18.22	20.13	22.04	23.93	
11				10.12	12.50	14.86	17.20	19.52	21.83	24.12	26.41	28.68	
12				11.93	14.75	17.53	20.29	23.03	25.75	28.45	31.14	33.82	
13				13.89	17.16	20.40	23.61	26.80	29.97	33.12	36.25	39.37	42.47
14				15.99	19.75	23.48	27.18	30.84	34.49	38.11	41.72	45.31	48.88
15					22.51	26.76	30.98	35.16	39.31	43.44	47.55	51.64	55.71
16					25.45	30.25	35.01	39.73	44.43	49.10	53.74	58.36	62.97
17							39.27	44.58	49.84	55.08	60.29	65.47	70.64
18							43.77	49.68	55.55	61.39	67.19	72.97	78.73
19							48.50	55.04	61.55	68.01	74.45	80.85	87.23
20								60.67	67.84	74.96	82.05	89.11	96.14
21								66.55	74.41	82.23	90.01	97.75	105.46
22								72.69	81.28	89.82	98.31	106.77	115.19
23								79.08	88.42	97.72	106.96	116.16	125.32
24								85.73	95.86	105.93	115.95	125.92	135.85

Log V = 0.342917 + 0.948258 (Log BH)

S.D. of coefficient 0.00361372

Percent error of predicted value = 11.7

Percent bias of predicted value = - 0.21

WESTERN LARCH

TOP VOLUME, INSIDE BARK, CUBIC FEET

(2-inch top diameter, inside bark)

	Height												
DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
3	0.092	0.124	0.147	0.166	0.183	0.198							
4	0.056	0.081	0.102	0.119	0.134	0.148	0.161						
5		0.059	0.076	0.091	0.105	0.118	0.130	0.141					
6		0.045	0.060	0.074	0.086	0.098	0.109	0.120					
7			0.049	0.062	0.073	0.084	0.094	0.104	0.144	0.124			
8			0.042	0.053	0.063	0.073	0.083	0.092	0.102	0.111			
9				0.046	0.055	0.065	0.074	0.083	0.092	0.101	0.109		
10				0.040	0.049	0.058	0.067	0.076	0.084	0.092	0.101	0.109	
11				0.036	0.045	0.053	0.061	0.069	0.077	0.085	0.093	0.101	
12				0.033	0.041	0.048	0.056	0.064	0.072	0.080	0.087	0.095	
13				0.030	0.037	0.045	0.052	0.060	0.067	0.075	0.082	0.090	0.097
14				0.027	0.034	0.041	0.049	0.056	0.063	0.070	0.077	0.085	0.092
15					0.032	0.039	0.045	0.052	0.059	0.066	0.073	0.080	0.088
16					0.030	0.036	0.043	0.049	0.056	0.063	0.070	0.077	0.084
17							0.040	0.047	0.053	0.060	0.067	0.073	0.080
18							0.038	0.044	0.051	0.057	0.064	0.070	0.077
19							0.036	0.042	0.048	0.055	0.061	0.067	0.074
20								0.040	0.046	0.052	0.059	0.065	0.071
21								0.039	0.044	0.050	0.056	0.063	0.069
22								0.037	0.043	0.049	0.054	0.060	0.067
23								0.036	0.041	0.047	0.053	0.059	0.065
24								0.034	0.040	0.045	0.051	0.057	0.063

Log V = - 0.218386 - 2.61784 (log D) + 0.900808 (log D) (log H)

S.D. of coefficient 0.19533 0.08398

Percent error of predicted values = 17.3

Percent bias of predicted values = - 1.25

WESTERN LARCH

TOP VOLUME, INSIDE BARK, CUBIC FEET
(3-inch top diameter, inside bark)

	Height												
DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
4	0.220	0.336	0.429	0.511	0.585	0.653	0.717						
5		0.227	0.303	0.371	0.434	0.493	0.550	0.604					
6		0.166	0.227	0.285	0.339	0.392	0.442	0.491					
7			0.179	0.228	0.276	0.322	0.368	0.412	0.455	0.498			
8			0.145	0.188	0.231	0.272	0.313	0.354	0.394	0.434			
9				0.159	0.197	0.235	0.272	0.310	0.347	0.384	0.420		
10				0.137	0.171	0.206	0.240	0.275	0.309	0.344	0.379	0.413	
11				0.119	0.151	0.182	0.214	0.246	0.279	0.311	0.344	0.377	
12				0.105	0.134	0.163	0.193	0.223	0.254	0.285	0.316	0.347	
13				0.094	0.120	0.148	0.175	0.204	0.233	0.262	0.291	0.321	0.352
14				0.084	0.109	0.134	0.161	0.187	0.215	0.242	0.271	0.299	0.328
15					0.099	0.123	0.148	0.173	0.199	0.226	0.253	0.280	0.308
16					0.091	0.114	0.137	0.161	0.186	0.211	0.237	0.263	0.290
17							0.127	0.150	0.174	0.198	0.223	0.248	0.274
18							0.119	0.141	0.163	0.187	0.211	0.235	0.260
19							0.112	0.132	0.154	0.177	0.200	0.223	0.248
20								0.125	0.146	0.167	0.190	0.213	0.236
21								0.118	0.138	0.159	0.181	0.203	0.226
22								0.112	0.132	0.152	0.173	0.194	0.216
23								0.107	0.125	0.145	0.165	0.186	0.208
24								0.102	0.120	0.139	0.158	0.179	0.200

$\text{Log } V = 0.574917 - 3.0534 (\log D) + 1.00746 (\log D)(\log H)$

S.D. of coefficient 0.23626 0.098734

Percent error of predicted values = 16.1

Percent bias of predicted values = - 1.37

WESTERN LARCH

TOP VOLUME, INSIDE BARK, CUBIC FEET

(4-inch top diameter, inside bark)

	Height												
DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
5		0.668	0.902	1.117	1.318	1.508	1.691	1.867					
6		0.466	0.651	0.826	0.993	1.154	1.311	1.464					
7			0.494	0.640	0.782	0.921	1.057	1.192	1.325	1.456			
8			0.389	0.513	0.635	0.757	0.877	0.997	1.116	1.235			
9				0.422	0.529	0.637	0.744	0.852	0.960	1.068	1.177		
10				0.355	0.450	0.546	0.643	0.740	0.839	0.938	1.038	1.139	
11				0.303	0.388	0.474	0.562	0.652	0.743	0.834	0.927	1.021	
12				0.262	0.339	0.417	0.498	0.580	0.664	0.750	0.836	0.924	
13				0.230	0.299	0.371	0.445	0.522	0.600	0.679	0.760	0.843	0.926
14				0.203	0.267	0.333	0.402	0.473	0.545	0.620	0.696	0.774	0.853
15					0.240	0.301	0.365	0.431	0.499	0.569	0.641	0.715	0.790
16					0.217	0.274	0.333	0.395	0.460	0.526	0.594	0.664	0.735
17							0.306	0.365	0.425	0.488	0.553	0.619	0.688
18							0.283	0.338	0.395	0.455	0.516	0.580	0.645
19							0.262	0.314	0.369	0.426	0.484	0.545	0.608
20								0.294	0.345	0.399	0.456	0.514	0.574
21								0.275	0.324	0.376	0.430	0.486	0.544
22								0.258	0.306	0.355	0.407	0.461	0.516
23								0.244	0.289	0.336	0.386	0.438	0.491
24								0.230	0.273	0.319	0.367	0.417	0.469

$\text{Log } V = 1.20417 - 3.35498 (\log D) + 1.06157 (\log D)(\log H)$

S.D. of coefficient 0.242998 0.100253

Percent error of predicted values = 15.3

Percent bias of predicted values = - 1.25

WESTERN LARGE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(5-inch top diameter, inside bark)

	Height												
DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
6		1.183	1.633	2.053	2.452	2.835	3.205	3.565					
7			1.212	1.555	1.886	2.207	2.522	2.831	3.134	3.433			
8			0.937	1.222	1.502	1.777	2.049	2.318	2.584	2.848			
9				0.988	1.228	1.468	1.766	1.943	2.180	2.416	2.652		
10				0.817	1.026	1.237	1.448	1.660	1.872	2.085	2.299	2.513	
11				0.688	0.872	1.059	1.248	1.439	1.632	1.825	2.020	2.217	
12				0.588	0.752	0.920	1.090	1.264	1.439	1.616	1.796	1.977	
13				0.509	0.656	0.808	0.963	1.121	1.282	1.445	1.611	1.779	1.949
14				0.445	0.578	0.716	0.858	1.003	1.152	1.303	1.457	1.614	1.772
15					0.514	0.640	0.771	0.905	1.043	1.183	1.327	1.474	1.623
16					0.461	0.576	0.697	0.822	0.950	1.081	1.216	1.354	1.494
17							0.634	0.750	0.870	0.994	1.120	1.250	1.382
18							0.580	0.689	0.801	0.917	1.037	1.159	1.284
19							0.533	0.635	0.741	0.851	0.963	1.080	1.199
20								0.588	0.688	0.792	0.899	1.009	1.123
21								0.547	0.641	0.740	0.841	0.946	1.055
22								0.510	0.600	0.693	0.790	0.890	0.994
23								0.477	0.562	0.651	0.744	0.840	0.939
24								0.448	0.529	0.614	0.702	0.794	0.889

$\text{Log } V = 1.71647 - 3.44297 (\log D) + 1.02285 (\log D)(\log H)$

S.D. of coefficient 0.253695 0.103695

Percent error predicted values = 17.2

Percent bias of predicted values = - 1.39

WESTERN LARCH

TOP VOLUME, INSIDE BARK, CUBIC FEET
(6-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
7			2.576	3.252	3.896	4.516	5.116	5.700	6.271	6.829			
8			1.968	2.524	3.062	3.585	4.097	4.599	5.092	5.578			
9				2.019	2.476	2.925	3.368	3.805	4.238	4.666	5.091		
10				1.653	2.047	2.438	2.826	3.212	3.596	3.978	4.358	4.737	
11				1.380	1.724	2.068	2.412	2.755	3.099	3.443	3.780	4.130	
12				1.170	1.474	1.779	2.087	2.396	2.706	3.017	3.330	3.643	
13				1.005	1.275	1.549	1.826	2.106	2.388	2.673	2.959	3.247	3.536
14				0.873	1.116	1.363	1.615	1.870	2.128	2.389	2.652	2.918	3.186
15					0.985	1.210	1.439	1.673	1.911	2.152	2.396	2.642	2.892
16					0.877	1.082	1.293	1.508	1.728	1.951	2.178	2.408	2.641
17							1.169	1.368	1.572	1.780	1.992	2.207	2.425
18							1.063	1.248	1.438	1.632	1.830	2.032	2.238
19							0.971	1.144	1.322	1.504	1.690	1.880	2.074
20								1.053	1.220	1.391	1.567	1.746	1.930
21								0.974	1.131	1.292	1.458	1.628	1.802
22								0.904	1.052	1.204	1.361	1.522	1.688
23								0.841	0.981	1.126	1.275	1.428	1.585
24								0.786	0.918	1.055	1.197	1.343	1.493

Log V = 2.11511 - 3.43175 (log D) + 0.958133 (log D) (log H)

S.D. of coefficient 0.256364 0.104981

Percent error of predicted values = 15.2

Percent bias of predicted values = - 1.21

WESTERN LARCH

TOP VOLUME, INSIDE BARK, CUBIC FEET
(7-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
8			3.525	4.586	5.625	6.646	7.652	8.647	9.631	10.605			
9				3.602	4.470	5.331	6.188	7.040	7.890	8.736	9.579		
10				2.903	3.639	4.377	5.117	5.858	6.601	7.344	8.089	8.834	
11				2.387	3.021	3.662	4.309	4.961	5.617	6.278	6.942	7.609	
12				1.997	2.549	3.112	3.683	4.262	4.848	5.440	6.037	6.640	
13				1.695	2.181	2.679	3.188	3.706	4.233	4.768	5.309	5.857	6.411
14				1.456	1.887	2.332	2.789	3.257	3.734	4.220	4.714	5.215	5.723
15					1.649	2.050	2.463	2.888	3.323	3.767	4.220	4.681	5.150
16					1.454	1.816	2.192	2.580	2.979	3.387	3.805	4.231	4.665
17							1.965	2.321	2.688	3.065	3.452	3.848	4.252
18							1.773	2.101	2.440	2.790	3.150	3.518	3.895
19							1.608	1.912	2.227	2.552	2.888	3.233	3.586
20								1.748	2.042	2.346	2.660	2.983	3.315
21								1.605	1.880	2.165	2.459	2.764	3.076
22								1.480	1.737	2.005	2.283	2.569	2.865
23								1.370	1.611	1.864	2.125	2.396	2.676
24								1.272	1.499	1.737	1.985	2.242	2.507

$\text{Log } V = 2.51253 - 3.67288 (\log D) + 1.01315 (\log D)(\log H)$

S.D. of coefficient 0.26597 0.108819

Percent error of predicted values = 15.0

Percent bias of predicted values = - 1.14

WESTERN LARCH

TOP VOLUME, INSIDE BARK, CUBIC FEET
(8-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
9				5.854	7.429	9.026	10.641	12.272	13.917	15.574	17.243		
10				4.628	5.940	7.285	8.657	10.052	11.468	12.904	14.356	15.824	
11				3.741	4.853	6.001	7.182	8.392	9.627	10.884	12.163	13.461	
12				3.081	4.034	5.028	6.057	7.117	8.205	9.318	10.455	11.614	
13				2.577	3.404	4.273	5.178	6.116	7.083	8.077	9.096	10.139	11.203
14				2.185	2.909	3.675	4.478	5.315	6.182	7.076	7.996	8.941	9.907
15					2.512	3.194	3.912	4.664	5.446	6.256	7.092	7.953	8.836
16					2.191	2.801	3.448	4.127	4.837	5.575	6.339	7.128	7.940
17							3.062	3.680	4.328	5.003	5.705	6.431	7.181
18							2.737	3.302	3.896	4.518	5.165	5.837	6.531
19							2.462	2.981	3.528	4.102	4.702	5.325	5.971
20								2.705	3.211	3.743	4.300	4.881	5.485
21								2.466	2.936	3.431	3.951	4.493	5.058
22								2.258	2.695	3.157	3.643	4.152	4.683
23								2.076	2.484	2.917	3.372	3.851	4.350
24								1.915	2.297	2.703	3.132	3.582	4.054

Log V = 2.89616 - 4.02373 (log D) + 1.11914 (log D) (log H)

S.D. of coefficient 0.302677 0.120186

Percent error of predicted values = 16.3

Percent bias of predicted values = -1.14

DOUGLAS FIR

TOTAL VOLUME, INSIDE BARK, INCLUDING STUMP AND TOP, CUBIC FEET

DBH	Height 10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.19	0.25	0.33	0.43	0.57	0.76							
3	0.44	0.56	0.72	0.93	1.20	1.55							
4	0.79	1.00	1.27	1.61	2.04	2.59	3.29						
5	1.25	1.56	1.96	2.45	3.07	3.85	4.82						
6	1.82	2.25	2.79	3.46	4.30	5.33	6.60	8.18	10.15				
7		3.07	3.77	4.64	5.70	7.00	8.61	10.58	13.00				
8		4.01	4.89	5.97	7.28	8.88	10.83	13.22	16.12				
9		5.08	6.15	7.46	9.04	10.95	13.27	16.08	19.48	23.61			
10			7.56	9.10	10.96	13.21	15.91	19.16	23.08	27.81			
11			9.10	10.90	13.06	15.65	18.74	22.46	26.91	32.24			
12			10.78	12.85	15.32	18.26	21.77	25.96	30.95	36.90	44.00		
13			12.59	14.95	17.74	21.06	24.99	29.66	35.21	41.79	49.59		
14				17.19	20.32	24.02	28.39	33.56	39.66	46.88	55.41	65.49	
15				19.59	23.07	27.16	31.97	37.64	44.32	52.18	61.43	72.33	
16				22.13	25.96	30.46	35.73	41.91	49.17	57.68	67.66	79.37	
17				24.82	29.02	33.92	39.66	46.37	54.21	63.37	74.09	86.61	
18				27.65	32.23	37.55	43.76	51.00	59.43	69.25	80.70	94.04	
19					35.59	41.34	48.03	55.80	64.83	75.32	87.50	101.66	
20						45.29	52.47	60.78	70.41	81.56	94.48	109.45	126.79
21						49.39	57.06	65.92	76.15	87.98	101.63	117.41	135.64
22						53.65	61.82	71.23	82.07	94.57	108.96	125.54	144.65
23						58.07	66.74	76.70	88.16	101.32	116.45	133.84	153.83
24						62.63	71.81	82.34	94.40	108.24	124.11	142.30	163.16

Log V= -1.48037 + 2.11615 (log D) + 0.0137202 (H) - 0.00563672 (log D) (log H)

S.D. of Coefficient 0.0262754 0.00056526 0.000420829

Percent error of predicted value 14.0

Percent bias of predicted value - 0.85

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET

(2-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
3	0.074	0.091	0.103	0.113	0.121	0.128						
4	0.053	0.069	0.081	0.090	0.098	0.105	0.112					
5	0.040	0.056	0.067	0.076	0.084	0.091	0.097					
6	0.033	0.047	0.057	0.066	0.073	0.080	0.087	0.092	0.098			
7		0.040	0.050	0.058	0.066	0.072	0.079	0.084	0.090			
8		0.035	0.044	0.052	0.060	0.066	0.072	0.078	0.083			
9		0.031	0.040	0.048	0.055	0.061	0.067	0.073	0.078			
10			0.037	0.044	0.051	0.057	0.063	0.068	0.074			
11			0.034	0.041	0.047	0.053	0.059	0.065	0.070			
12			0.031	0.038	0.044	0.050	0.056	0.061	0.067	0.071		
13			0.029	0.036	0.042	0.048	0.053	0.059	0.064	0.069	0.073	
14				0.034	0.040	0.045	0.051	0.056	0.061	0.066	0.071	
15				0.032	0.038	0.043	0.049	0.054	0.059	0.064	0.068	
16				0.031	0.036	0.042	0.047	0.052	0.057	0.061	0.066	
17				0.029	0.035	0.040	0.045	0.050	0.055	0.059	0.064	
18				0.028	0.033	0.038	0.043	0.048	0.053	0.058	0.062	
19					0.032	0.037	0.042	0.047	0.051	0.056	0.061	0.065
20					0.031	0.036	0.041	0.045	0.050	0.055	0.059	0.063
21						0.035	0.039	0.044	0.049	0.053	0.058	0.062
22						0.034	0.038	0.043	0.047	0.052	0.056	0.061
23						0.033	0.037	0.042	0.046	0.051	0.055	0.059
24						0.032	0.036	0.041	0.045	0.050	0.054	0.058

Log V = - 0.57482 - 1.79704 (log D) + 0.63400 (log D) (log H)

S.D. of coefficients 0.14463 0.064633

Percent error of predicted values = 18.1

Percent bias of predicted values = - 1.48

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET

(3-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
4	0.228	0.303	0.359	0.404	0.444	0.478	0.510					
5	0.165	0.230	0.280	0.321	0.358	0.390	0.420					
6	0.127	0.184	0.228	0.266	0.300	0.331	0.359	0.386	0.411			
7		0.152	0.192	0.227	0.258	0.287	0.314	0.340	0.364			
8		0.128	0.165	0.198	0.227	0.254	0.280	0.304	0.327			
9		0.111	0.145	0.175	0.203	0.228	0.253	0.276	0.298			
10			0.129	0.157	0.183	0.208	0.231	0.253	0.274			
11			0.116	0.142	0.167	0.190	0.213	0.234	0.254			
12			0.105	0.130	0.154	0.176	0.197	0.218	0.238	0.257	0.276	
13			0.096	0.120	0.142	0.163	0.184	0.204	0.223	0.242	0.260	
14				0.111	0.132	0.153	0.173	0.192	0.210	0.229	0.246	
15				0.103	0.124	0.143	0.163	0.181	0.199	0.217	0.234	
16				0.097	0.116	0.135	0.154	0.172	0.189	0.207	0.224	
17				0.091	0.110	0.128	0.146	0.163	0.180	0.197	0.214	
18				0.086	0.104	0.121	0.139	0.156	0.172	0.189	0.205	
19					0.098	0.116	0.132	0.149	0.165	0.181	0.197	0.213
20					0.094	0.110	0.127	0.143	0.159	0.174	0.190	0.205
21						0.106	0.121	0.137	0.153	0.168	0.183	0.198
22						0.101	0.117	0.132	0.147	0.162	0.177	0.192
23						0.097	0.112	0.127	0.142	0.157	0.172	0.186
24						0.093	0.108	0.123	0.137	0.152	0.166	0.181

Log V = 0.22840 - 2.13544 (log D) + 0.68846 (log D) (log H)

S.D. of coefficients 0.14572 0.063693

Percent error of predicted values = 19.0

Percent error of predicted values = -1.59

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET
(4-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
5	0.499	0.682	0.820	0.934	1.033	1.122	1.203					
6	0.376	0.534	0.654	0.757	0.847	0.928	1.003	1.073	1.138			
7		0.433	0.541	0.633	0.715	0.791	0.860	0.925	0.987			
8		0.362	0.459	0.543	0.618	0.688	0.753	0.814	0.872			
9		0.309	0.397	0.474	0.544	0.609	0.670	0.727	0.782			
10			0.348	0.420	0.485	0.546	0.603	0.657	0.709			
11			0.310	0.376	0.437	0.494	0.548	0.600	0.649			
12			0.278	0.340	0.397	0.451	0.503	0.552	0.599	0.645	0.689	
13			0.252	0.310	0.364	0.415	0.464	0.511	0.556	0.600	0.643	
14				0.285	0.336	0.384	0.431	0.476	0.519	0.562	0.603	
15				0.263	0.311	0.358	0.402	0.445	0.487	0.528	0.568	
16				0.244	0.290	0.335	0.377	0.419	0.459	0.498	0.537	
17				0.227	0.272	0.314	0.355	0.395	0.434	0.472	0.509	
18				0.213	0.255	0.296	0.336	0.374	0.412	0.448	0.484	
19					0.241	0.280	0.318	0.355	0.391	0.427	0.462	0.497
20					0.228	0.265	0.302	0.338	0.373	0.408	0.442	0.476
21						0.252	0.288	0.323	0.357	0.391	0.424	0.456
22						0.240	0.275	0.309	0.342	0.375	0.407	0.439
23						0.229	0.263	0.296	0.328	0.360	0.391	0.423
24						0.219	0.252	0.284	0.315	0.346	0.377	0.408

Log V = 0.77690 - 2.19153 (log D) + 0.64755 (log D) (log H)

S.D. of coefficients 0.141294 0.0606155

Percent error of predicted values = 15.7

Percent bias of predicted values = -1.28

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET

(5-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
6	0.885	1.264	1.558	1.806	2.026	2.225	2.409	2.580	2.742			
7		1.001	1.256	1.475	1.671	1.850	2.016	2.173	2.321			
8		0.818	1.042	1.237	1.414	1.576	1.729	1.872	2.009			
9		0.684	0.884	1.060	1.220	1.369	1.509	1.642	1.768			
10			0.763	0.923	1.070	1.207	1.336	1.460	1.578			
11			0.668	0.814	0.949	1.076	1.197	1.312	1.423			
12			0.591	0.726	0.852	0.970	1.083	1.191	1.295	1.397		
13			0.529	0.654	0.770	0.881	0.987	1.089	1.188	1.284	1.377	
14				0.593	0.702	0.806	0.906	1.003	1.096	1.188	1.277	
15				0.542	0.644	0.742	0.837	0.929	1.018	1.105	1.190	
16				0.497	0.594	0.687	0.777	0.864	0.949	1.032	1.113	
17				0.459	0.551	0.639	0.724	0.808	0.889	0.968	1.046	
18				0.426	0.513	0.597	0.678	0.758	0.836	0.912	0.987	
19					0.479	0.559	0.637	0.713	0.788	0.861	0.934	1.005
20					0.450	0.526	0.601	0.674	0.746	0.816	0.886	0.955
21						0.496	0.568	0.638	0.707	0.775	0.843	0.910
22						0.469	0.538	0.606	0.672	0.738	0.804	0.868
23						0.445	0.511	0.576	0.641	0.705	0.768	0.830
24						0.423	0.487	0.550	0.612	0.674	0.735	0.796

$\text{Log } V = 1.27970 - 2.37428 (\log D) + 0.66145 (\log D)(\log H)$

S.D. of coefficients 0.156891 0.0669301

Percent error of predicted values = 18.2

Percent bias of predicted values = - 1.59

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET

(6-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
7		1.922	2.447	2.904	3.317	3.698	4.054	4.389	4.709			
8		1.539	1.992	2.392	2.758	3.097	3.417	3.720	4.010			
9		1.265	1.662	2.016	2.343	2.649	2.938	3.214	3.480			
10			1.413	1.730	2.025	2.303	2.567	2.821	3.065			
11			1.220	1.507	1.775	2.029	2.272	2.506	2.733			
12			1.067	1.328	1.574	1.808	2.033	2.250	2.461	2.667		
13			0.943	1.182	1.409	1.626	1.835	2.038	2.235	2.428	2.617	
14				1.062	1.271	1.473	1.660	1.859	2.044	2.226	2.404	
15				0.960	1.156	1.344	1.528	1.706	1.881	2.053	2.222	
16				0.875	1.057	1.234	1.406	1.575	1.741	1.904	2.064	
17				0.801	0.972	1.138	1.301	1.461	1.618	1.773	1.926	
18				0.737	0.898	1.055	1.209	1.361	1.511	1.658	1.804	
19					0.833	0.982	1.129	1.273	1.416	1.557	1.696	1.835
20					0.776	0.917	1.057	1.195	1.331	1.466	1.600	1.733
21						0.860	0.993	1.124	1.255	1.384	1.513	1.641
22						0.808	0.935	1.061	1.187	1.311	1.435	1.558
23						0.762	0.884	1.004	1.125	1.244	1.364	1.483
24						0.720	0.837	0.953	1.069	1.184	1.299	1.414

Log V = 1.69009 - 2.58148 (log D) + 0.70505 (log D) (log H)

S.D. of coefficients 0.180394 0.0762105

Percent error of predicted values = 20.0

Percent bias of predicted values = - 1.95

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET
(7-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
8		2.722	3.534	4.253	4.910	5.522	6.098	6.645	7.169			
9		2.213	2.916	3.547	4.128	4.673	5.190	5.683	6.157			
10			2.456	3.015	3.535	4.025	4.493	4.941	5.374			
11			2.102	2.603	3.071	3.517	3.943	4.354	4.752			
12			1.824	2.276	2.702	3.109	3.500	3.879	4.247	4.605		
13			1.600	2.011	2.401	2.775	3.137	3.488	3.830	4.164	4.491	
14				1.794	2.153	2.499	2.834	3.161	3.480	3.793	4.100	
15				1.613	1.945	2.266	2.579	2.884	3.183	3.477	3.767	
16				1.460	1.768	2.068	2.361	2.647	2.929	3.206	3.479	
17				1.330	1.617	1.898	2.173	2.443	2.708	2.971	3.230	
18				1.218	1.487	1.750	2.009	2.264	2.516	2.764	3.010	
19					1.373	1.621	1.866	2.107	2.346	2.582	2.817	3.049
20					1.273	1.507	1.739	1.968	2.196	2.421	2.645	2.867
21					1.185	1.407	1.627	1.845	2.062	2.277	2.491	2.704
22						1.317	1.526	1.734	1.941	2.147	2.352	2.557
23						1.237	1.436	1.635	1.833	2.030	2.227	2.424
24						1.164	1.355	1.545	1.735	1.925	2.114	2.303

Log V = 2.02163 - 2.68436 (log D) + 0.71282 (log D) (log H)

S.D. of coefficients 0.180002 0.074193

Percent error of predicted values = 18.9

Percent bias of predicted values = - 1.64

DOUGLAS-FIR

TOP VOLUME, INSIDE BARK, CUBIC FEET
(8-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
9		3.416	4.701	5.896	7.029	8.115	9.162	10.178	11.167			
10			3.862	4.897	5.887	6.843	7.772	8.677	9.563			
11			3.233	4.140	5.015	5.865	6.696	7.511	8.311			
12			2.748	3.551	4.332	5.095	5.845	6.583	7.312	8.031		
13			2.367	3.084	3.786	4.477	5.158	5.832	6.499	7.160	7.815	
14				2.706	3.342	3.971	4.594	5.213	5.827	6.438	7.045	
15				2.396	2.975	3.552	4.125	4.696	5.264	5.831	6.396	
16				2.138	2.669	3.199	3.729	4.258	4.787	5.316	5.844	
17				1.922	2.410	2.901	3.392	3.885	4.378	4.873	5.368	
18				1.737	2.189	2.644	3.102	3.563	4.025	4.489	4.955	
19					1.999	2.423	2.851	3.283	3.717	4.154	4.594	5.036
20					1.834	2.230	2.632	3.037	3.447	3.860	4.275	4.694
21					1.689	2.061	2.438	2.821	3.208	3.599	3.993	4.391
22						1.911	2.267	2.629	2.995	3.366	3.741	4.120
23						1.779	2.115	2.458	2.806	3.158	3.515	3.877
24						1.661	1.979	2.304	2.635	2.971	3.312	3.657

Log V = 2.45281 - 3.08509 (log D) + 0.82531 (log D) (log H)

S.D. of coefficients 0.179249 0.0728263

Percent error of predicted values = 16.7

Percent bias of predicted values = - 1.38

LODGEPOLE PINE

TOTAL VOLUME, INSIDE BARK, INCLUDING STUMP AND TOP, CUBIC FEET

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
2	0.12	0.24	0.35	0.46	0.57	0.68	0.79					
3	0.27	0.52	0.77	1.01	1.25	1.50	1.74					
4		0.90	1.34	1.76	2.18	2.60	3.02	3.43				
5		1.39	2.05	2.71	3.36	4.00	4.64	5.28				
6		1.97	2.92	3.85	4.77	5.69	6.60	7.50				
7		2.66	3.92	5.18	6.42	7.65	8.88	10.10	11.31	12.52		
8		3.43	5.08	6.70	8.30	9.90	11.48	13.06	14.63	16.19		
9			6.37	8.40	10.42	12.42	14.41	16.39	18.35	20.31	22.27	
10			7.80	10.29	12.76	15.21	17.65	20.07	22.48	24.89	27.28	
11			9.38	12.37	15.34	18.28	21.21	24.12	27.02	29.90	32.78	
12					18.14	21.62	25.08	28.52	31.95	35.36	38.76	
13					21.16	25.22	29.26	33.28	37.28	41.26	45.23	
14					24.41	29.09	33.75	38.38	43.00	47.59	52.17	
15					27.88	33.23	38.55	43.84	49.11	54.36	59.58	
16					31.57	37.63	43.65	49.65	55.61	61.55	67.47	73.37
17					35.48	42.29	49.06	55.80	62.50	69.18	75.83	82.46
18					39.61	47.22	54.77	62.29	69.78	77.23	84.66	92.06
19					43.96	52.40	60.79	69.13	77.44	85.71	93.96	102.17
20						57.84	67.10	76.31	85.48	94.62	103.72	112.78

Log V = - 0.2771 + 0.963354 (log BH)

S.D. of coefficient = 0.0042446

Percent error of predicted values = 12.9

Percent bias of predicted values = 0.50

LODGEPOLE PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(2-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
3	0.074	0.099	0.117	0.132	0.144	0.156	0.166					
4	0.047	0.067	0.083	0.096	0.108	0.119	0.129	0.138				
5	0.033	0.050	0.064	0.076	0.087	0.097	0.106	0.115				
6	0.024	0.039	0.051	0.062	0.072	0.082	0.091	0.099				
7			0.043	0.053	0.062	0.071	0.079	0.088	0.095	0.103		
8			0.036	0.046	0.054	0.063	0.071	0.079	0.086	0.094		
9			0.032	0.040	0.048	0.056	0.064	0.071	0.079	0.086	0.093	
10			0.028	0.036	0.044	0.051	0.058	0.065	0.072	0.079	0.086	
11				0.032	0.040	0.047	0.054	0.060	0.067	0.074	0.081	
12					0.036	0.043	0.050	0.056	0.063	0.069	0.076	
13					0.034	0.040	0.046	0.053	0.059	0.065	0.072	
14					0.031	0.037	0.043	0.050	0.056	0.062	0.068	
15					0.029	0.035	0.041	0.047	0.053	0.059	0.065	
16					0.027	0.033	0.039	0.045	0.050	0.056	0.062	0.068
17						0.031	0.037	0.042	0.048	0.054	0.060	0.065
18						0.030	0.035	0.040	0.046	0.052	0.057	0.063
19						0.028	0.033	0.039	0.044	0.050	0.055	0.061
20						0.027	0.032	0.037	0.042	0.048	0.053	0.059

Log V = - 0.365736 - 2.46962 (log D) + 0.86752 (log D) (log H)

S.D. of coefficients 0.248634 0.111916

Percent error of predicted values = 27.9

Percent bias of predicted values = - 3.07

LODGEPOLE PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(3-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
4	0.220	0.305	0.369	0.422	0.469	0.510	0.549	0.584				
5	0.150	0.219	0.273	0.319	0.361	0.398	0.433	0.466				
6	0.110	0.167	0.214	0.254	0.291	0.325	0.357	0.387				
7			0.174	0.210	0.243	0.274	0.304	0.331	0.358	0.384		
8			0.145	0.178	0.208	0.236	0.264	0.290	0.315	0.339		
9			0.124	0.153	0.181	0.207	0.233	0.257	0.281	0.303	0.326	
10			0.108	0.135	0.160	0.185	0.208	0.231	0.253	0.275	0.296	
11				0.119	0.143	0.166	0.188	0.210	0.231	0.251	0.272	
12					0.129	0.151	0.172	0.192	0.212	0.232	0.251	
13					0.118	0.138	0.158	0.177	0.196	0.215	0.234	
14					0.108	0.127	0.146	0.164	0.183	0.201	0.218	
15					0.100	0.118	0.136	0.153	0.171	0.188	0.205	
16					0.092	0.110	0.127	0.144	0.160	0.177	0.194	0.210
17						0.102	0.119	0.135	0.151	0.167	0.183	0.199
18						0.096	0.112	0.127	0.143	0.158	0.174	0.189
19						0.091	0.106	0.121	0.136	0.151	0.166	0.181
20						0.086	0.100	0.114	0.129	0.144	0.158	0.173

$\text{Log } V = 0.376276 - 2.49626 (\log D) + 0.779565 (\log D) (\log H)$

S.D of coefficients 0.29006 0.127401

Percent error of predicted values = 28.1

Percent bias of predicted values = - 3.31

LODGEPOLE PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(4-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
5	0.440	0.630	0.777	0.902	1.012	1.113	1.205	1.291				
6	0.320	0.477	0.603	0.712	0.810	0.900	0.983	1.062				
7			0.487	0.583	0.671	0.752	0.828	0.900	0.969	1.035		
8			0.405	0.491	0.570	0.644	0.713	0.780	0.844	0.906		
9			0.344	0.421	0.493	0.561	0.626	0.688	0.747	0.805	0.861	
10			0.297	0.367	0.433	0.496	0.556	0.614	0.670	0.725	0.778	
11				0.325	0.386	0.444	0.500	0.555	0.607	0.659	0.709	
12					0.347	0.401	0.454	0.505	0.555	0.604	0.652	
13					0.314	0.366	0.415	0.464	0.511	0.557	0.603	
14					0.287	0.335	0.382	0.428	0.473	0.518	0.561	
15					0.264	0.309	0.354	0.398	0.441	0.483	0.525	
16					0.244	0.287	0.329	0.371	0.412	0.453	0.493	0.533
17						0.267	0.308	0.348	0.387	0.426	0.465	0.503
18						0.250	0.289	0.327	0.365	0.402	0.440	0.477
19						0.235	0.272	0.309	0.345	0.381	0.417	0.453
20						0.221	0.257	0.292	0.327	0.362	0.397	0.432

$\text{Log } V = 0.860507 - 2.48286 (\log D) + 0.741235 (\log D)(\log H)$

S.D. of coefficients 0.295097 0.129431

Percent error of predicted values = 25.7

Percent bias of predicted values = - 2.69

LODGEPOLE PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET
(5-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
6		1.133	1.422	1.672	1.894	2.098	2.288	2.466				
7			1.135	1.353	1.550	1.732	1.903	2.064	2.217	2.364		
8			0.934	1.126	1.303	1.467	1.622	1.769	1.910	2.046		
9			0.786	0.958	1.117	1.267	1.409	1.544	1.674	1.800	1.922	
10			0.674	0.829	0.974	1.111	1.242	1.367	1.488	1.606	1.720	
11				0.728	0.861	0.987	1.108	1.225	1.338	1.448	1.555	
12					0.768	0.885	0.998	1.108	1.214	1.318	1.419	
13					0.692	0.801	0.907	1.010	1.110	1.208	1.304	
14					0.629	0.731	0.830	0.927	1.022	1.115	1.206	
15					0.575	0.671	0.764	0.856	0.946	1.034	1.121	
16					0.528	0.619	0.708	0.795	0.880	0.964	1.048	1.130
17						0.574	0.658	0.741	0.822	0.903	0.983	1.062
18						0.535	0.615	0.693	0.771	0.849	0.925	1.001
19						0.500	0.576	0.652	0.726	0.800	0.874	0.947
20						0.469	0.542	0.614	0.686	0.757	0.828	0.898

$\text{Log } V = 1.29058 - 2.52686 (\log D) + 0.720985 (\log D)(\log H)$

S.D. of coefficients 0.286708 0.130059

Percent error of predicted values = 20.2

Percent bias of predicted values = - 1.79

LODGEPOLE PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET

(6-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
7			2.337	2.845	3.315	3.756	4.174	4.574	4.958	5.329		
8			1.844	2.275	2.679	3.061	3.427	3.779	4.119	4.449		
9			1.495	1.868	2.220	2.556	2.880	3.193	3.498	3.794	4.085	
10			1.241	1.566	1.877	2.176	2.465	2.747	3.022	3.291	3.555	
11				1.335	1.612	1.880	2.141	2.397	2.647	2.893	3.136	
12					1.403	1.646	1.883	2.116	2.346	2.573	2.796	
13					1.235	1.456	1.673	1.888	2.099	2.309	2.516	
14					1.097	1.300	1.500	1.698	1.894	2.089	2.282	
15					0.983	1.170	1.355	1.538	1.721	1.903	2.084	
16					0.887	1.060	1.231	1.403	1.574	1.744	1.914	2.084
17						0.966	1.126	1.286	1.447	1.607	1.767	1.927
18						0.885	1.035	1.185	1.336	1.487	1.639	1.791
19						0.814	0.955	1.097	1.240	1.383	1.526	1.670
20						0.753	0.886	1.020	1.154	1.290	1.426	1.564

Log V = 1.86838 - 2.97158 (log D) + 0.810267 (log D) (log H)

S.D. of coefficients 0.279111 0.127879

Percent error of predicted values = 17.2

Percent bias of predicted values = - 1.50

LODGEPOLE PINE

TOP VOLUME, INSIDE BARK, CUBIC FEET

(7-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
8			3.195	4.083	4.938	5.768	6.578	7.371	8.149	8.915		
9			2.508	3.249	3.972	4.681	5.378	6.065	6.744	7.415	8.080	
10			2.019	2.649	3.270	3.883	4.492	5.095	5.694	6.289	6.881	
11				2.202	2.742	3.280	3.816	4.351	4.885	5.418	5.950	
12					2.334	2.811	3.289	3.768	4.248	4.729	5.211	
13					2.014	2.439	2.868	3.300	3.735	4.173	4.612	
14					1.756	2.139	2.527	2.919	3.316	3.716	4.119	
15					1.546	1.892	2.245	2.604	2.968	3.336	3.708	
16					1.372	1.688	2.011	2.340	2.675	3.016	3.361	3.710
17						1.516	1.813	2.117	2.427	2.743	3.064	3.390
18						1.370	1.644	1.926	2.214	2.508	2.808	3.113
19						1.244	1.499	1.761	2.030	2.305	2.586	2.872
20						1.136	1.373	1.618	1.869	2.127	2.391	2.661

Log V = 2.36229 - 3.45108 (log D) + 0.943681 (log D) (log H)

S.D. of coefficients 0.282235 0.129594

Percent error of predicted values = 15.6

Percent bias of predicted values = - 1.18

LODGEPOLE PILE

TOP VOLUME, INSIDE BARK, CUBIC FEET

(8-inch top diameter, inside bark)

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120
9			4.403	5.645	6.846	8.014	9.156	10.276	11.377	12.462	13.532	
10			3.505	4.548	5.567	6.566	7.550	8.520	9.479	10.428	11.368	
11				3.741	4.617	5.483	6.341	7.192	8.036	8.876	9.711	
12					3.892	4.651	5.407	6.160	6.912	7.662	8.410	
13					3.326	3.997	4.670	5.343	6.017	6.692	7.367	
14					2.875	3.474	4.077	4.683	5.292	5.904	6.518	
15					2.511	3.049	3.593	4.142	4.696	5.254	5.815	
16						2.699	3.193	3.693	4.199	4.710	5.226	5.747
17						2.406	2.857	3.316	3.781	4.252	4.728	5.209
18						2.160	2.573	2.995	3.424	3.860	4.302	4.749
19						1.950	2.331	2.720	3.118	3.523	3.934	4.351
20						1.769	2.122	2.483	2.853	3.230	3.614	4.004

Log V = 2.70909 - 3.50204 (log D) + 0.905578 (log D) (log H)

S.D. of coefficients 0.282546 0.130545

Percent error of predicted values = 13.7

Percent bias of predicted values = - 1.06

PONDEROSA PINE

GROSS BARK VOLUME, ENTIRE STEM, CUBIC FEET

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.03	0.05	0.07	0.09	0.10	0.12							
3	0.07	0.12	0.16	0.20	0.23	0.27							
4	0.12	0.21	0.28	0.35	0.42	0.48	0.55						
5	0.18	0.32	0.44	0.55	0.66	0.76	0.86	0.96					
6	0.26	0.45	0.63	0.80	0.96	1.11	1.26	1.40					
7	0.34	0.61	0.85	1.09	1.31	1.52	1.73	1.93	2.13				
8	0.44	0.79	1.11	1.42	1.71	2.00	2.28	2.55	2.82				
9		0.99	1.41	1.80	2.18	2.55	2.91	3.26	3.60	3.94			
10		1.22	1.73	2.22	2.70	3.16	3.61	4.05	4.49	4.92			
11			2.09	2.69	3.27	3.84	4.40	4.94	5.48	6.01			
12				3.21	3.91	4.59	5.26	5.92	6.57	7.21	7.84		
13				3.77	4.60	5.41	6.20	6.99	7.76	8.53	9.28		
14				4.37	5.34	6.29	7.23	8.15	9.06	9.96	10.85	11.73	
15				5.02	6.15	7.25	8.33	9.41	10.46	11.51	12.55	13.58	
16				5.72	7.01	8.27	9.52	10.75	11.97	13.18	14.38	15.56	
17				6.46	7.92	9.37	10.79	12.20	13.59	14.97	16.33	17.69	
18					8.90	10.53	12.14	13.73	15.31	16.87	18.42	19.96	
19					9.93	11.76	13.57	15.36	17.14	18.90	20.65	22.38	
20						13.07	15.09	17.09	19.07	21.04	23.00	24.94	26.88
21						14.44	16.69	18.91	21.12	23.31	25.49	27.66	29.81
22						15.88	18.37	20.83	23.27	25.70	28.11	30.51	32.90
23						17.40	20.13	22.84	25.53	28.21	30.87	33.52	36.16
24						18.98	21.98	24.95	27.91	30.84	33.77	36.68	39.57

Log V = - 2.70154 + 1.65961 (log D) + 0.648249 (log H) + 0.218658 (log D) (log H)

S.D. of coefficients = 0.094535 0.048470 0.049889

Percent error of predicted values = 15.8

Percent bias of predicted values = 0.72

WESTERN LARCH

GROSS BARK VOLUME, ENTIRE STEM, CUBIC FEET

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.02	0.04	0.07	0.09	0.11	0.13							
3	0.05	0.10	0.15	0.20	0.25	0.30							
4	0.09	0.17	0.26	0.35	0.44	0.53	0.62						
5		0.27	0.41	0.55	0.69	0.83	0.98	1.12					
6		0.39	0.60	0.80	1.00	1.20	1.41	1.61					
7			0.81	1.09	1.36	1.64	1.92	2.20	2.47	2.75			
8			1.06	1.42	1.78	2.14	2.51	2.87	3.24	3.60			
9				1.80	2.26	2.72	3.18	3.64	4.10	4.56	5.03		
10				2.22	2.79	3.36	3.92	4.49	5.07	5.64	6.21	6.78	
11				2.69	3.38	4.06	4.75	5.44	6.13	6.83	7.52	8.21	
12				3.21	4.02	4.84	5.66	6.48	7.31	8.13	8.96	9.78	
13				3.77	4.72	5.69	6.65	7.61	8.58	9.55	10.52	11.49	12.46
14				4.37	5.48	6.60	7.72	8.84	9.96	11.08	12.21	13.33	14.46
15					6.30	7.58	8.86	10.15	11.44	12.73	14.02	15.32	16.61
16						8.63	10.09	11.55	13.02	14.49	15.96	17.44	18.91
17						9.75	11.40	13.05	14.71	16.37	18.03	19.69	21.36
18						10.93	12.78	14.64	16.50	18.36	20.22	22.09	23.96
19							14.25	16.32	18.39	20.46	22.54	24.62	26.71
20							15.79	18.09	20.38	22.68	24.99	27.30	29.61
21							17.42	19.95	22.48	25.02	27.56	30.11	32.65
22							19.13	21.90	24.69	27.47	30.26	33.06	35.85
23							20.91	23.95	26.99	30.04	33.09	36.14	39.20
24							22.78	26.09	29.40	32.72	36.04	39.37	42.70

Log V = - 3.28754 + 2.00871 (log D) + 1.01494 (log H)

S.D. of coefficients 0.043917 0.062718

Percent error of predicted values = 16.7

Percent bias of predicted values = 0.06

DOUGLAS FIR

GROSS BARK VOLUME, ENTIRE STEM, CUBIC FEET

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.03	0.05	0.07	0.09	0.11	0.13							
3	0.05	0.10	0.14	0.19	0.23	0.27							
4	0.08	0.16	0.24	0.32	0.39	0.46	0.54						
5	0.12	0.24	0.36	0.47	0.59	0.70	0.82						
6	0.16	0.33	0.49	0.66	0.82	0.99	1.15	1.32	1.48				
7		0.43	0.65	0.87	1.10	1.32	1.55	1.77	2.00				
8		0.54	0.83	1.11	1.40	1.70	1.99	2.29	2.58				
9		0.67	1.02	1.38	1.75	2.12	2.49	2.86	3.24	3.62			
10			1.23	1.67	2.12	2.58	3.04	3.50	3.97	4.44			
11			1.46	1.99	2.53	3.08	3.63	4.20	4.76	5.33			
12			1.71	2.33	2.97	3.62	4.29	4.95	5.63	6.31	7.00		
13			1.97	2.70	3.45	4.21	4.99	5.77	6.57	7.37	8.18		
14				3.09	3.95	4.84	5.74	6.65	7.57	8.51	9.45	10.41	
15				3.50	4.49	5.50	6.54	7.58	8.65	9.72	10.81	11.91	
16				3.94	5.06	6.21	7.38	8.58	9.79	11.02	12.26	13.52	
17				4.40	5.66	6.96	8.28	9.63	11.00	12.39	13.80	15.22	
18				4.88	6.29	7.74	9.23	10.74	12.28	13.84	15.42	17.03	
19					6.96	8.57	10.22	11.91	13.62	15.37	17.14	18.93	
20						9.43	11.26	13.13	15.03	16.97	18.94	20.93	22.94
21						10.33	12.35	14.41	16.51	18.65	20.82	23.03	25.26
22						11.27	13.49	15.75	18.06	20.41	22.80	25.22	27.68
23						12.25	14.67	17.14	19.67	22.24	24.86	27.52	30.21
24						13.27	15.90	18.59	21.35	24.15	27.01	29.91	32.85

Log V = - 2.84449 + 1.36408 (log D) + 0.777852 (log H) + 0.285834 (log D) (log H)

S.D. of coefficients 0.119975 0.056642 0.061730

Percent error of predicted values = 15.2

Percent bias of predicted values = - 0.12

LODGEPOLE PINE

GROSS BARK VOLUME, ENTIRE STEM, CUBIC FEET

Height

DBH	10	20	30	40	50	60	70	80	90	100	110	120	130
2	0.02	0.04	0.06	0.07	0.09	0.11							
3	0.03	0.06	0.10	0.13	0.16	0.19	0.23	0.27					
4	0.04	0.09	0.14	0.19	0.24	0.29	0.35	0.41					
5	0.05	0.12	0.19	0.26	0.34	0.41	0.48	0.58					
6	0.05	0.16	0.25	0.34	0.44	0.53	0.63	0.76					
7			0.30	0.42	0.54	0.67	0.80	0.93	1.06	1.29			
8			0.37	0.51	0.66	0.82	0.98	1.14	1.30	1.59			
9			0.43	0.60	0.78	0.97	1.16	1.36	1.56	1.77	2.20		
10			0.49	0.70	0.91	1.13	1.36	1.60	1.84	2.08	2.61		
11					1.04	1.30	1.57	1.84	2.13	2.42	3.04		
12					1.18	1.48	1.79	2.11	2.43	2.77	3.11		
13					1.33	1.67	2.02	2.38	2.75	3.13	3.52		
14					1.48	1.86	2.25	2.66	3.08	3.51	3.96		
15					1.63	2.06	2.50	2.95	3.42	3.91	4.41		
16						2.26	2.75	3.26	3.78	4.32	4.88	5.45	
17						2.47	3.01	3.57	4.15	4.75	5.36	6.00	
18						2.69	3.28	3.89	4.53	5.19	5.87	6.56	
19						2.91	3.55	4.23	4.92	5.64	6.39	7.15	
20						3.14	3.84	4.57	5.33	6.11	6.92	7.75	

Log V = - 2.56625 + 0.670089 (log H) + 0.790892 (log D) (log H)

S.D. of coefficients 0.082494 0.027529

Percent error of predicted values = 25.1

Percent bias of predicted values = - 0.15

PONDEROSA PINE

DOUBLE BARK THICKNESS, DIAMETER OUTSIDE BARK

D.o.b.	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	
2	0.16	0.17	0.18	0.19	0.21	0.22	0.23	0.24	0.25	0.26	2
3	0.28	0.29	0.30	0.31	0.32	0.33	0.35	0.36	0.37	0.38	3
4	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.49	0.50	4
5	0.51	0.52	0.53	0.54	0.56	0.57	0.58	0.59	0.60	0.61	5
6	0.63	0.64	0.65	0.66	0.67	0.68	0.70	0.71	0.72	0.73	6
7	0.74	0.75	0.77	0.78	0.79	0.80	0.81	0.82	0.84	0.85	7
8	0.86	0.87	0.88	0.89	0.91	0.92	0.93	0.94	0.95	0.96	8
9	0.98	0.99	1.00	1.01	1.02	1.03	1.05	1.06	1.07	1.08	9
10	1.09	1.10	1.12	1.13	1.14	1.15	1.16	1.18	1.19	1.20	10
11	1.21	1.22	1.23	1.25	1.26	1.27	1.28	1.29	1.30	1.32	11
12	1.33	1.34	1.35	1.36	1.37	1.39	1.40	1.41	1.42	1.43	12
13	1.44	1.46	1.47	1.48	1.49	1.50	1.51	1.53	1.54	1.55	13
14	1.56	1.57	1.58	1.60	1.61	1.62	1.63	1.64	1.65	1.67	14
15	1.68	1.69	1.70	1.71	1.72	1.74	1.75	1.76	1.77	1.78	15
16	1.79	1.81	1.82	1.83	1.84	1.85	1.86	1.88	1.89	1.90	16
17	1.91	1.92	1.93	1.95	1.96	1.97	1.98	1.99	2.00	2.02	17
18	2.03	2.04	2.05	2.06	2.07	2.09	2.10	2.11	2.12	2.13	18
19	2.14	2.16	2.17	2.18	2.19	2.20	2.22	2.23	2.24	2.25	19
20	2.26	2.27	2.29	2.30	2.31	2.32	2.33	2.34	2.36	2.37	20

Values computed from the single bark thickness equation.

$T = -0.0376115 + 0.0584243 (D.o.b.)$

S.D. of the coefficient = 0.00044242

S.E. = 0.080279

$R^2 = 0.906$

WESTERN LARCH

DOUBLE BARK THICKNESS, BY DIAMETER OUTSIDE BARK

D.o.b.	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	
2	0.16	0.17	0.18	0.19	0.21	0.22	0.23	0.24	0.26	0.27	2
3	0.28	0.29	0.31	0.32	0.33	0.35	0.36	0.37	0.38	0.40	3
4	0.41	0.42	0.43	0.45	0.46	0.47	0.48	0.50	0.51	0.52	4
5	0.53	0.55	0.56	0.57	0.58	0.60	0.61	0.62	0.63	0.65	5
6	0.66	0.67	0.68	0.70	0.71	0.72	0.73	0.75	0.76	0.77	6
7	0.79	0.80	0.81	0.82	0.84	0.85	0.86	0.87	0.89	0.90	7
8	0.91	0.92	0.94	0.95	0.96	0.97	0.99	1.00	1.01	1.02	8
9	1.04	1.05	1.06	1.07	1.09	1.10	1.11	1.12	1.14	1.15	9
10	1.16	1.17	1.19	1.20	1.21	1.23	1.24	1.25	1.26	1.28	10
11	1.29	1.30	1.31	1.33	1.34	1.35	1.36	1.38	1.39	1.40	11
12	1.41	1.43	1.44	1.45	1.46	1.48	1.49	1.50	1.51	1.53	12
13	1.54	1.55	1.56	1.58	1.59	1.60	1.61	1.63	1.64	1.65	13
14	1.67	1.68	1.69	1.70	1.72	1.73	1.74	1.75	1.77	1.78	14
15	1.79	1.80	1.82	1.83	1.84	1.85	1.87	1.88	1.89	1.90	15
16	1.92	1.93	1.94	1.95	1.97	1.98	1.99	2.00	2.02	2.03	16
17	2.04	2.05	2.07	2.08	2.09	2.11	2.12	2.13	2.14	2.16	17
18	2.17	2.18	2.19	2.21	2.22	2.23	2.24	2.26	2.27	2.28	18
19	2.29	2.31	2.32	2.33	2.34	2.36	2.37	2.38	2.39	2.41	19
20	2.42	2.43	2.44	2.46	2.47	2.48	2.49	2.51	2.52	2.53	20

Values computed from the single bark thickness equation:

$T = -0.0474573 + 0.0628597\ (D.o.b.)$

S.D. of the coefficient = 0.00056604

S.E. = 0.068016

R^2 = 0.905

DOUGLAS-FIR

DOUBLE BARK THICKNESS, DIAMETER OUTSIDE BARK

D.o.b.	0.0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	
2	0.13	0.14	0.15	0.16	0.17	0.18	0.18	0.19	0.20	0.21	2
3	0.22	0.23	0.24	0.25	0.26	0.27	0.28	0.29	0.30	0.30	3
4	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40	4
5	0.41	0.42	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	5
6	0.50	0.51	0.52	0.53	0.54	0.54	0.55	0.56	0.57	0.58	6
7	0.59	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.66	0.67	7
8	0.68	0.69	0.73	0.71	0.72	0.73	0.74	0.75	0.76	0.77	8
9	0.78	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	9
10	0.87	0.88	0.89	0.89	0.90	0.91	0.92	0.93	0.94	0.95	10
11	0.96	0.97	0.98	0.99	1.00	1.01	1.01	1.02	1.03	1.04	11
12	1.05	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.13	12
13	1.14	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	13
14	1.24	1.25	1.25	1.26	1.27	1.28	1.29	1.30	1.31	1.32	14
15	1.33	1.34	1.35	1.36	1.37	1.37	1.38	1.39	1.40	1.41	15
16	1.42	1.43	1.44	1.45	1.46	1.47	1.48	1.49	1.49	1.50	16
17	1.51	1.52	1.53	1.54	1.55	1.56	1.57	1.58	1.59	1.60	17
18	1.61	1.61	1.62	1.63	1.64	1.65	1.66	1.67	1.68	1.69	18
19	1.70	1.71	1.72	1.73	1.73	1.74	1.75	1.76	1.77	1.78	19
20	1.79	1.80	1.81	1.82	1.83	1.84	1.85	1.85	1.86	1.87	20

Values computed from the single bark thickness equation:

$T = -0.0276673 + 0.0461299 \text{ (D.o.b.)}$

S.D. of the coefficient = 0.000372306

S.E. = 0.0659404

R^2 = 0.895

LODGEPOLE PINE

DOUBLE BARK THICKNESS, BY DIAMETER OUTSIDE BARK

D.o.b.	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
2	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14
3	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.17
4	0.17	0.17	0.17	0.18	0.18	0.18	0.19	0.19	0.19	0.19
5	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.22	0.22	0.22
6	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.25	0.25	0.25
7	0.25	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.28	0.28
8	0.28	0.29	0.29	0.29	0.29	0.30	0.30	0.30	0.31	0.31
9	0.31	0.31	0.32	0.32	0.32	0.33	0.33	0.33	0.33	0.34
10	0.34	0.34	0.35	0.35	0.35	0.35	0.36	0.36	0.36	0.37
11	0.37	0.37	0.37	0.38	0.38	0.38	0.39	0.39	0.39	0.39
12	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.42	0.42	0.42
13	0.43	0.43	0.43	0.43	0.44	0.44	0.44	0.45	0.45	0.45
14	0.45	0.46	0.46	0.46	0.47	0.47	0.47	0.47	0.48	0.48
15	0.48	0.49	0.49	0.49	0.49	0.50	0.50	0.50	0.51	0.51
16	0.51	0.51	0.52	0.52	0.52	0.53	0.53	0.53	0.53	0.54
17	0.54	0.54	0.55	0.55	0.55	0.55	0.56	0.56	0.56	0.57
18	0.57	0.57	0.57	0.58	0.58	0.58	0.59	0.59	0.59	0.59

Values computed from the single bark thickness equation:

$T = 0.0271161 + 0.0142837\ (D.o.b.)$

S.D. of the coefficient = 0.000378354

S.E. = 0.0402561

$R^2 = 0.556$

RELATIONSHIP BETWEEN STUMP DIAMETER AND DIAMETER AT BREAST HEIGHT

Stump diameter range, i.b.				dbh. class, o.b.
Ponderosa Pine	Douglas-Fir	Western Larch	Lodgepole Pine	
1.7-2.6	1.7-2.6	1.7-2.6	1.4-2.4	2
2.7-3.6	2.7-3.7	2.7-3.5	2.5-3.6	3
3.7-4.6	3.8-4.7	3.6-4.5	3.7-4.7	4
4.7-5.5	4.8-5.7	4.6-5.5	4.8-5.8	5
5.6-6.5	5.8-6.8	5.6-6.4	6.0-7.0	6
6.6-7.5	6.9-7.8	6.5-7-4	7.1-8.1	7
7.6-8.5	7.9-8.8	7.5-8.3	8.3-9.3	8
8.6-9.5	8.9-9.9	8.4-9.3	9.4-10.4	9
9.6-10.5	10.0-10.9	9.4-10.3	10.5-11.6	10
10.6-11.5	11.0-11.9	10.4-11.2	11.7-12.7	11
11.6-12.5	12.0-13.0	11.3-12.2	12.8-13.9	12
12.6-13.5	13.1-14.0	12.3-13.2	14.0-15.0	13
13.6-14.5	14.1-15.0	13.3-14.0	15.1-16.1	14
14.6-15.5	15.2-16.1	14.2-15.1	16.3-17.3	15
15.6-16.5	16.2-17.1	15.2-16.1	17.4-18.4	16
16.6-17.5	17.2-18.2	16.2-17.0	18.6-19.6	17
17.6-18.5	18.3-19.2	17.1-18.0	19.7-20.7	18
18.6-19.4	19.3-20.2	18.1-19.0	20.8-21.9	19
19.5-20.4	20.3-21.3	19.1-19.9	22.0-23.0	20
20.5-21.4	21.4-22.3	20.0-20.9	23.1-24.2	21
21.5-22.4	22.4-23.3	21.0-21.9	24.3-25.3	22
22.5-23.4	23.4-24.4	22.0-22.8	25.4-26.5	23
23.5-24.4	24.5-25.4	22.9-23.8	26.6-27.6	24

Regression Equations

Species	Equation	S.D. of the Coefficient	R^2
Ponderosa pine	$D = -0.186432 + 1.00729\,S$	0.0060791	0.987
Douglas-fir	$D = -0.126425 + 0.965427\,S$	0.0062658	0.985
Western larch	$D = -0.253227 + 1.03641\,S$	0.0063114	0.991
Lodgepole pine	$D = 0.292117 + 0.873569\,S$	0.0078078	0.982

D = d.b.h.

PONDEROSA PINE

STAND VOLUME, CUBIC FEET

Basal Area (sq.ft.)	Average Height of Dominant Trees											
	20	30	40	50	60	70	80	90	100	110	120	130
20	144	216	288	360	432	504	576	648	720	792	864	936
40	288	432	576	720	864	1008	1152	1296	1440	1584	1728	1872
60	432	648	864	1080	1296	1512	1728	1943	2160	2376	2592	2808
80	576	864	1152	1440	1728	2016	2304	2592	2880	3168	3456	3744
100	720	1080	1440	1800	2160	2520	2880	3240	3600	3960	4320	4680
120	864	1296	1728	2160	2592	3024	3456	3887	4320	4752	5184	5616
140	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048	6552
160	1152	1728	2304	2880	3456	4032	4608	5184	5760	6336	6912	7488
180	1296	1944	2592	3240	3888	4536	5184	5832	6480	7128	7776	8424
200	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8640	9360
220	1584	2376	3168	3960	4752	5544	6336	7128	7920	8712	9504	10296
240	1728	2592	3456	4320	5184	6048	6912	7775	8640	9504	10368	11232
260	1871	2807	3743	4680	5615	6551	7487	8424	9360	10295	11231	12167
280	2016	3024	4032	5040	6048	7056	8064	9072	10080	11088	12096	13104
300	2160	3240	4320	5400	6480	7560	8640	9720	10800	11880	12960	14040

WESTERN LARCH

STAND VOLUME, CUBIC FEET

Basal Area (sq.ft.)	Average Height of Dominant Trees											
	20	30	40	50	60	70	80	90	100	110	120	130
20	144	216	288	360	432	504	576	648	720	792	864	936
40	288	432	576	720	864	1008	1152	1296	1440	1584	1728	1872
60	432	648	864	1080	1296	1512	1728	1943	2160	2376	2592	2808
80	576	864	1152	1440	1728	2016	2304	2592	2880	3168	3456	3744
100	720	1080	1440	1800	2160	2520	2880	3240	3600	3960	4320	4680
120	864	1296	1728	2160	2592	3024	3456	3887	4320	4752	5184	5616
140	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048	6552
160	1152	1728	2304	2880	3456	4032	4608	5184	5760	6336	6912	7488
180	1296	1944	2592	3240	3888	4536	5184	5832	6480	7128	7776	8424
200	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8640	9360
220	1584	2376	3168	3960	4752	5544	6336	7128	7920	8712	9504	10296
240	1728	2592	3456	4320	5184	6048	6912	7775	8640	9504	10368	11232
260	1871	2807	3743	4680	5615	6551	7487	8424	9360	10295	11231	12167
280	2016	3024	4032	5040	6048	7056	8064	9072	10080	11088	12096	13104
300	2160	3240	4320	5400	6480	7560	8640	9720	10800	11880	12960	14040

DOUGLAS-FIR

STAND VOLUME, CUBIC FEET

Basal Area (sq.ft.)	Average Height of Dominant Trees											
	20	30	40	50	60	70	80	90	100	110	120	130
20	160	240	320	400	480	560	648	720	800	880	960	1040
40	320	480	640	800	960	1120	1440	1600	1600	1760	1920	2080
60	480	720	960	1200	1440	1680	1920	2160	2400	2640	2880	3120
80	640	960	1280	1600	1920	2240	2560	2880	3200	3520	3840	4160
100	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200
120	960	1440	1920	2400	2880	3360	3840	4320	4800	5280	5760	6240
140	1120	1680	2240	2800	3360	3920	4480	5040	5600	6160	6720	7280
160	1280	1920	2560	3200	3840	5120	5760	6400	6400	7040	7680	8320
180	1440	2160	2880	3600	4320	5040	5760	6480	7200	7920	8640	9360
200	1600	2400	3200	4000	4800	5600	6400	7200	8000	8800	9600	10400
220	1760	2640	3520	4400	5280	6160	7040	7920	8800	9680	10560	11440
240	1920	2880	3840	4800	5760	6720	7680	8640	9600	10560	11520	12480
260	2080	3120	4160	5200	6240	7280	8320	9360	10400	11440	12480	13520
280	2240	3360	4480	5600	6720	7840	8960	10080	11200	12320	13440	14560
300	2400	3600	4800	6000	7200	8400	9600	10800	12000	13200	1400	15600

LODGEPOLE PINE

STAND VOLUME, CUBIC FEET

Basal Area (sq.ft.)	Average Height of Dominant Trees								
	20	30	40	50	60	70	80	90	100
20	184	286	368	460	552	644	736	828	920
40	368	552	736	920	1104	1288	1472	1656	1840
60	552	828	1104	1380	1656	1932	2208	2484	2760
80	736	1104	1472	1840	2208	2576	2944	3312	3680
100	920	1380	1840	2300	2760	3220	3680	4140	4600
120	1104	1656	2208	2760	3312	3864	4416	4968	5520
140	1288	1932	2576	3220	3864	4508	5152	5796	6440
160	1472	2208	2944	3680	4416	5152	5888	6624	7360
180	1656	2484	3312	4140	4968	5796	6624	7452	8280
200	1840	2760	3680	4600	5520	6440	7360	8280	9200
220	2024	3036	4048	5060	6072	7084	8096	9108	10120
240	2208	3312	4416	5520	6624	7728	8832	9936	11040
260	2392	3588	4784	5980	7176	8372	9568	10764	11960
280	2576	3864	5152	6440	7728	9016	10304	11592	12880
300	2760	4140	5520	6900	8280	9660	11040	12420	13800